

## Festival Activity: Raptors Over the Wenatchee

**Subject:** Science

**Concepts:** Predator/Prey relationships, food webs

**Key Vocabulary**

- Raptors

**Skills**

- Observation
- Listening
- Discussion

**Materials**

- All materials will be provided by activity leader

Raptors are predators and once freely soared the American skies as unquestioned rulers of the air. But as more and more people settled throughout the country, raptors became misunderstood and were thought of as pests of domestic livestock and were killed in large numbers. Today **raptors** (birds of prey) are protected by federal laws. These laws will help to insure that we can enjoy these magnificent birds for years to come.



### Grade Level Expectations (GLEs) or Evidence of Learning

Science

1.3.9 Understand that plant and animal species change over time.

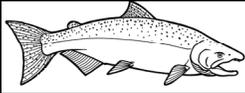
1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

### Objectives

Students will: 1) observe various mounted and live raptors (birds of prey) of the area, 2) explore the habits and life histories of these birds, and 3) learn unique adaptations of eagles, owls, vultures, ospreys and hawks.

### Suggested Procedure

Through direct observation and presentation, students explore the exciting world of raptors with a wildlife biologist. Students will observe the amazing adaptations of the Raptors Over the Wenatchee.



## Pre-Work: What Makes a Bird a Raptor?

**Subject:** Science

**Concepts:** Predator/Prey relationships, food webs

**Key Vocabulary**

- Raptor
- Diurnal
- Nocturnal
- Nictitating membrane

**Skills**

- Listening
- Observation
- Classification
- Application

**Materials**

- Pictures of several different birds including raptors (such as duck, robin, chicken, eagle, hawk, owl, falcon, etc.). Pictures can be easily printed from the Internet or collected from old magazines.
- Teacher Reference, “Beaks”
- Teacher Reference, “Feet”
- Teacher Reference, “Eyes”
- Teacher Reference, “Eyes, Nictitating Membrane”
- Teacher Reference, “Ears”

Birds have really become a big part of our lives. We eat them, use their eggs in cooking, make clothing from their feathers, sing about them, imitate them in our dance, paint pictures of them, try to fly as they do, name our kids and cars after them, keep them as pets, make up myths and stories about them, tromp all over the world to see them, and use bird-related words in our everyday speech. In fact, birds are so much a part of our lives that it's impossible to imagine what it would be like without them!



Photo credit: USFWS

**Grade Level Expectations (GLEs) or Evidence of Learning**

Science

1.3.9 Understand that plant and animal species change over time.

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

**Objective**

Students will learn what makes a bird a **raptor** (bird of prey).

## Background

The word **raptor** is derived from “rapere,” a Latin word, which means to *seize or capture*. More specifically, a raptor is a *bird of prey*. A bird of prey is a carnivore that kills and eats mammals, reptiles, amphibians, insects, and other birds. Many other birds hunt, kill, and eat meat, but they may not be a raptor. Three distinguishing traits that set raptors apart from other birds are their:

- hooked beaks with sharp edges
- feet with sharp, curved claws or talons
- keen eyesight

Raptors belong to two scientific orders, the Strigiformes and Falconiformes. The orders are divided into six groups with a total of 446 species worldwide. They include:

### Falconiforms

- Secretary Bird (1 specie in Africa)
- Falcons (63 species)
- Osprey (1 specie)
- Hawks and Eagles (226 species)
- Vultures (7 species)

### Strigiforms

- Owls (148 species)

Raptors also fit into two basic groupings — diurnal or nocturnal hunters.

#### **Diurnal** (daytime) hunters . . .

- include the order Falconiformes such as hawks, eagles, kites, vultures, harriers, ospreys, caracaras, buzzards, falcons, etc.
- traits shared include the hooked beak, sharp talons, and keen vision previously mentioned, and a fleshy cere at the base of the beak, a hind toe which opposes the other toes, and powerful flight.

#### **Nocturnal** (nighttime) hunters . . .

- include the order Strigiformes, including all owls
- traits shared include rounded heads with large, forward-directed eyes set in feathered disks, (see Teacher Reference, Ears) asymmetrical ear openings, and soft-edged flight feathers that allow silent flight

#### **EYES (See Teacher Reference: Eyes)**

Raptor’s are believed to have the keenest eyesight in nature because of the size of the eyeball and the eye muscles designed for rapid focus. Diurnal raptors have full color vision and two concentrations of cones (one directed to the side and one directed forward) in each eye, which control color perception. The sharpest point of vision at these concentrations is called the *fovea*.

When the fovea work in unison, they give raptors very accurate depth perception, very important for birds of prey that must focus quickly when chasing moving objects. The keenness of vision is related to the agility, size, and color of prey a raptor hunts. When a bird bobs its head, it is using its eyes like a range finder and focusing in on a specific area.

Nocturnal raptors, the owls, have an added advantage over other raptors with their remarkable sharp night vision. By contrast, the night vision of diurnal raptors is no better than human night vision. Owls have a concentration of more rods in their eyes that are essential for seeing under low light conditions. An owl's eyes are also located in the front of their heads, much like humans.

Birds often see much better than other animals, including people. They have very large eyes that focus keenly on near and faraway objects. Unlike many mammals, birds can see color. Birds use their keen eyesight to . . .

- find food
- keep an eye on enemies
- spot mates
- find a place to live

Bird's eyes are usually located toward the front and/or sides of its head, and may point almost directly forward or in opposite directions, giving it one of two types of vision or a combination of both. A bird that can focus its eyes independently, meaning that it can see two different objects at the same time has *monocular vision*. If a bird focuses straight ahead with both eyes on the same object at the same time, it has *binocular vision*, just like humans. Examples of birds with monocular and binocular vision are:

**MONOCULAR**

eagles  
falcons

**BINOCULAR**

owls

**(See Teacher Reference, "Eyes")**

Although birds may have monocular or binocular vision, or a combination of both, they vary in their capability to move their eyes in their sockets. Many birds can see all around without moving their head. Some birds have eyes that are relatively fixed in their sockets. These birds cannot roll their eyes around the way humans can. Instead, they have long, flexible necks that enable them to turn their heads to see in different directions. This is the reason you see some birds twisting and cocking their heads. Some birds can twist their heads from a half-circle (180°) to more than three-quarters of a circle (270°). Many birds have eye movement capability somewhere between the two extremes.

**(See Teacher Reference, "Eyes-Nictitating Membrane")**

Another thing that sets raptors apart from other birds is a special eyelid or *nictitating membrane*. This special transparent eyelid closes laterally across the eye and is used to . . .

- keep the eyes moist
- protect the eyes during flight
- protect the eyes when feeding themselves or their young

When humans close their eyes to blink and sleep the upper eyelid closes. Depending on the species, raptors have eyelids that close from either the bottom or top, for blinking and sleeping.

An additional form of eye protection in most raptors is a bony shield that projects above the eye. The bony shield adds protection when raptors pursue prey into brush, protects the eyes from injury while hunting, and also gives raptors a menacing appearance.

**BEAK (See Teacher Reference, “Beaks”)**

A raptor’s beak is one feature used to set them apart from other birds. Diurnal and nocturnal raptors possess strong hooked beaks with sharp cutting edges. The beaks have evolved over time based on the type of prey eaten. For example, the American kestrel has a small beak for eating small prey, like mice and insects. Eagles have powerful, heavy beaks for tearing large pieces of meat. Snail kites have a highly specialized long, curved beak for probing inside snail shells.

**LEGS/FEET (See Teacher Reference, “Feet”)**

Birds of prey have powerful leg and toe muscles that, when combined with their sharp talons, make their feet lethal weapons, perfectly designed to catch, hold, and carry prey. The length and size of a raptors toes and the curvature and thickness of its talons are related to the type of prey it pursues. Most birds of prey will have three toes pointing forward and one pointing backward. These toes can apply an extremely powerful grip on their prey, literally crushing it to death.

The talons may also be used to pierce a vulnerable spot, such as the back of the neck, to quickly kill the prey. Eagles and hawks kill their prey by dislocating the neck. Osprey have two toes facing forward and two facing backward. This allows them to hold the fish they catch with four claws, two on each side for a secure grip. Ospreys also have spiny scales on their feet that help them hold the slippery fish more securely. Owls also have four toes. However, one of the toes is very flexible, and can be rotated forward or backward for a two plus two or a three plus one toe arrangement.

**EARS (See Teacher Reference, “Ears”)**

Birds have a keen sense of hearing. Their ears are located on each side of the head, just below and in back of the eyes. In most birds the ear openings are positioned symmetrically on either side of the head, but in some birds the openings are asymmetrical in size and position (e.g. owls). Birds with asymmetric ear positions can better judge the distance and direction from which sound is coming. Some raptors, such as harriers, owls, and forest falcons, have feathers that surround their faces in the shape of a disk. This facial disk helps the raptor in capturing and directing sound waves to their ears. These special features, combined with the ability to bob the head up and down and/or rotate the head in almost a full circle, allows a bird to locate sound coming from any direction. On most birds you are not able to see the ears, because the small holes are covered with feathers. Birds depend greatly on their sense of hearing for the following reasons . . .

- communication
- finding prey
- finding mates
- detecting danger

## **NESTS**

Nesting habitats of raptors vary. A few examples of what raptors may do to help rear their young include . . .

- not building a nest (vultures, owls, falcons, and other raptors), but using the stick nests or cavities created by other birds
- nesting and laying eggs in sand or gravel, depressions, or scrapes
- nesting and laying eggs on the ground
- nesting and laying eggs on cliff faces or in treetops (eagles do this and are known to build very large nests)
- nesting and laying eggs in ground burrows of mammals (only burrowing owls do this)

For those raptor species that build nests, typically the female constructs while the male provides the material. Many raptors build a new nest each year, while others, particularly large raptors, reuse old nests or alternate between a number of nests.

## **EGGS**

Raptor eggs are typically large, rounded or oblong ovals, and vary in color. The number of eggs laid depends on their size. Large raptors lay fewer eggs than smaller raptors. It is believed that larger raptors live longer and need fewer eggs or young to sustain the viability of the species, while the opposite is true for smaller raptors.

Raptors have a two to three day lapse between laying each egg, and generally begin incubation after all of the eggs are laid for that nesting season (owls begin incubation immediately after the first egg is laid). The female does the incubating while the male provides food. The period of incubation also varies with the size of a bird. For owls, hawks, and falcons there is usually a 26 to 35 day incubation period, while for eagles and vultures it is 36 to 50 days.

Raptors of temperate climates breed in spring and summer when warmer weather ensures rapid growth and survival of young. Other natural resources also aid in the success of a nesting season . . .

- growing plants that provide cover, nest sites, and nest material
- longer days that allow parents to gather more food
- the abundance of young prey species available during this time of year

After an eggshell is first cracked, it usually takes one to two days before hatching is complete. Raptor chicks grow quickly, doubling their birth weight in only a few days. The length of time a raptor spends from hatching until it is ready to *fledge* depends on size. Larger raptors stay in the nest from two to three months, while smaller raptors stay until they are three to four weeks old. In temperate areas, like Idaho, raptors must grow rapidly in order to be ready to migrate when the seasons change and become too warm.

## **Conclusion**

All members of the vertebrate group, Ayes, have many traits and characteristics in common. Birds of prey, however, possess a few unique traits that set them apart from other birds. Piercing eyes, keen vision, sharp beaks, and strong talons reflect the raptor's power, endurance, and special hunting skills that many people have found inspiring throughout history.

### **Suggested Procedure (Part 1 - Before class)**

Collect pictures of birds in advance to complete this activity. Pictures can be from magazines or downloaded from websites such as:

<http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/>

<http://www.illinoisraptorcenter.org/Field%20Guide/guidecover.html>

### **Suggested Procedure (Part 1 - During class)**

1. Divide students into groups of three or four.
2. Define “What is a raptor?” Write the definition on the board and list the three traits that make raptors (birds of prey) different from other kinds of birds (hooked beaks with sharp edges, feet with sharp, curved claws or talons, and keen eyesight).
3. Have students list the characteristics of raptors on a separate sheet of paper. One student in each group may be designated as the recorder, but all students should participate. Students may include other things such as wings and feathers, but be sure they include the three key characteristics of a raptor.
4. Hand out pictures of raptors and non-raptors to students.
5. Students will then classify the pictures you will provide for them as raptors or non-raptors and justify their reasoning based on the characteristics that they have listed for birds of prey.
6. Have each group share with the rest of the class one picture of a raptor. What makes this bird a raptor? Have each group share one picture of a non-raptor. What makes these birds different from raptors?

### **Assessment**

What characteristics distinguish birds of prey from other birds?

Describe how you would go about classifying a bird as a raptor or a non-raptor.

Lesson designed by Lisa Koch, Director of Education, The Raptor Center at the University of Minnesota. The Raptor Center Web site: [www.theraptorcenter.org](http://www.theraptorcenter.org)

### **Suggested Procedure (Part 2)**

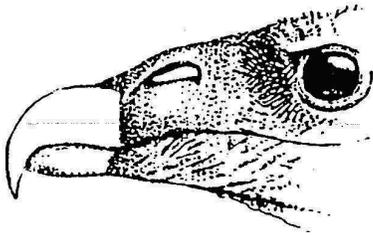
1. Make a transparency of Teacher Reference, “Beaks.” Share information on beaks with students.
2. Ask students, based on the trait that raptors have hooked beaks with sharp edges, which of the birds are raptors? (Answers: vulture, hawk, bald eagle, snail kite, falcon, and golden eagle)
3. Make a transparency of Teacher Reference, “Feet.” Share information on feet with students.
4. Ask students, based on the trait that raptors have feet with sharp, curved claws or talons, which of the pictures of feet belong to a raptor? (Answers: vulture, hawk, eagle, osprey, owl, falcon)

5. Make transparencies of Teacher References, “Eyes” (to discuss raptor’s keen eyesight and monocular vision vs. binocular vision), “Eyes, Nictitating Membrane” (to discuss how the third eye lid functions on different raptors), and “Ears” (to show location of ears and facial disk of owls).

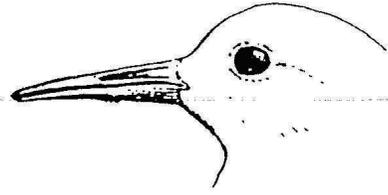


Paul Kerris

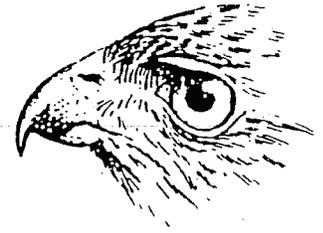
**Teacher Reference: Beaks**



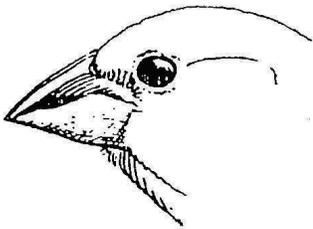
Vulture



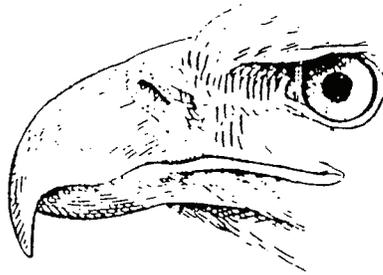
Shore bird (plover/killdeer)



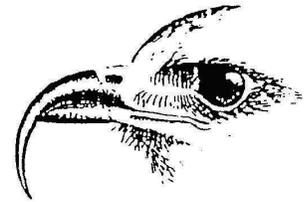
Hawk



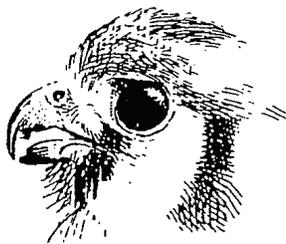
Finch (canary/sparrow)



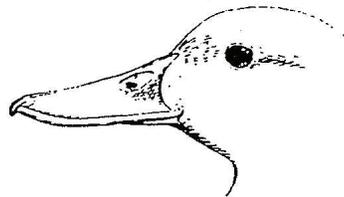
Bald eagle



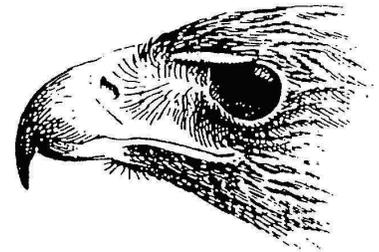
Snail kite



Falcon

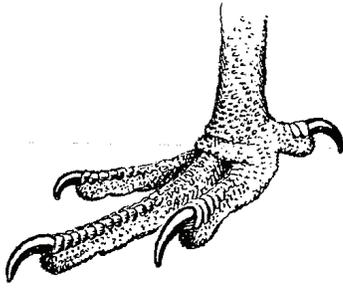


Duck

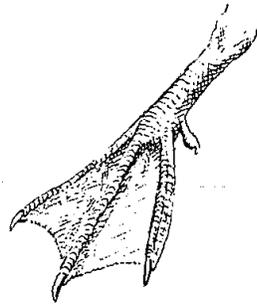


Golden eagle

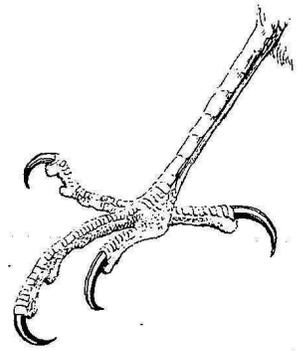
**Teacher Reference: Feet**



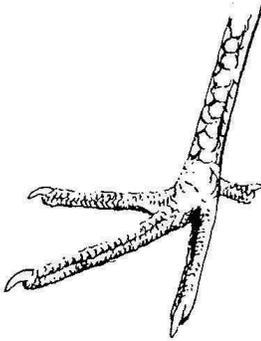
Vulture



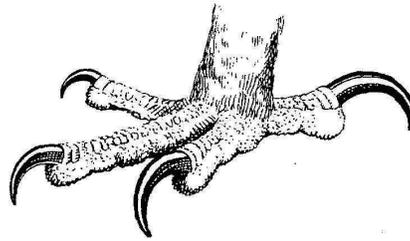
Duck



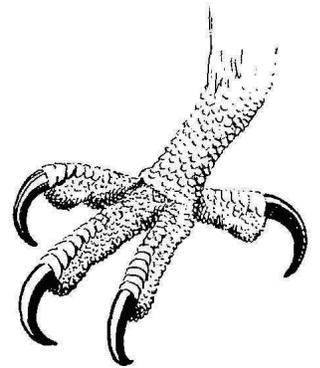
Hawk



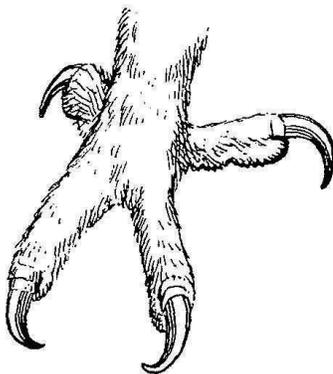
Chicken



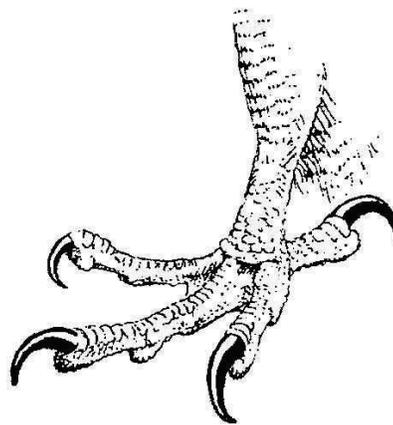
Eagle



Osprey



Owl



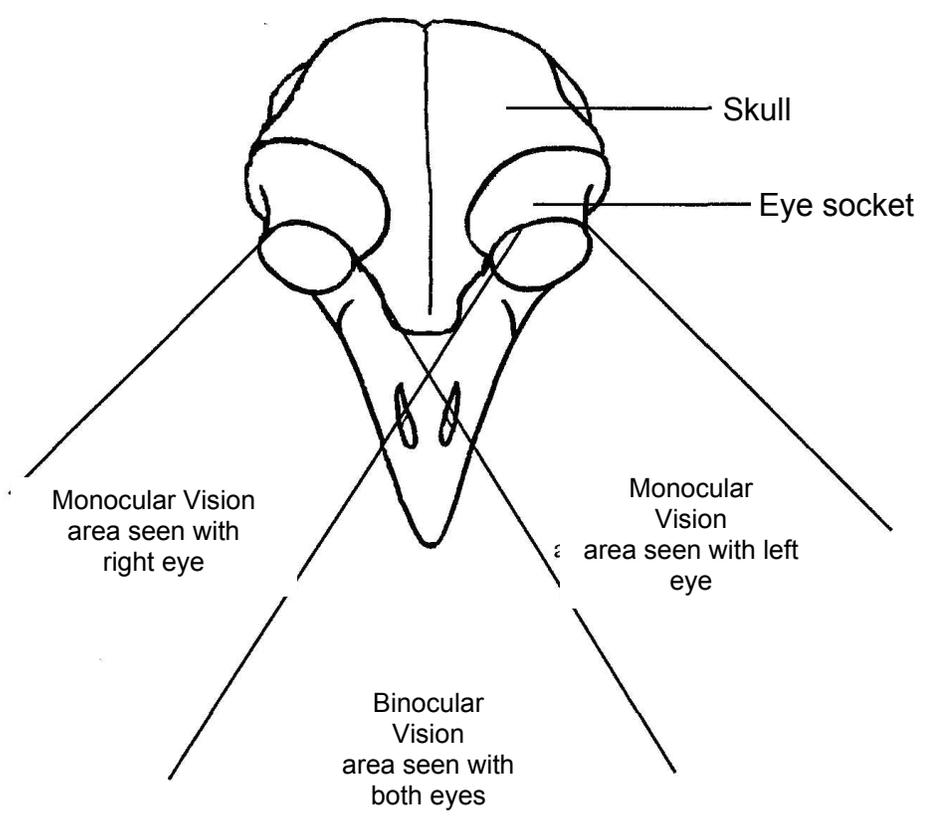
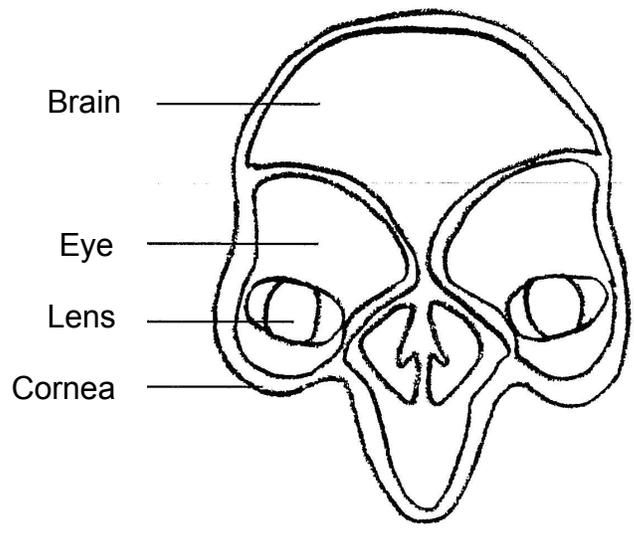
Falcon



Sparrow

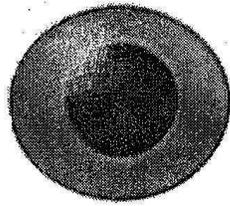
Illustration © Wise as an Owl by L. Langelier, 1992. The Peregrine Fund, Inc., Boise, ID.

# Teacher Reference: Eyes

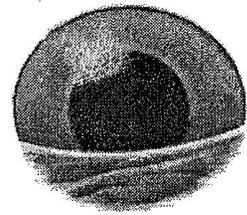


Top illustration ©The Cambridge Encyclopedia of Ornithology by M. Brooke and T. Birkhead. 1991. Cambridge University Press, New York, NY. Bottom illustration © Owls Whoo Are They by K. Jarvis and D. Holt. 1996. Mountain Press Publishing Company, Missoula, MT.

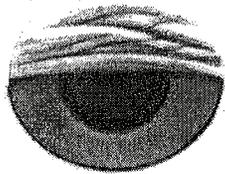
## Teacher Reference: Eyes—Nictitating Membrane



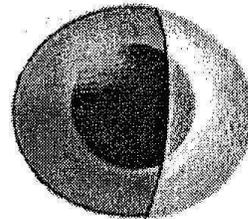
Birds of prey have large and bright eyes and three eyelids to protect their eyes.



Hawk close their eyes by moving the lower lids up.



Owls close their eyes by moving the upper lids down.



The third eyelid closes from side to side; it helps to moisten and clean the eye.

**Teacher Reference: Ears**

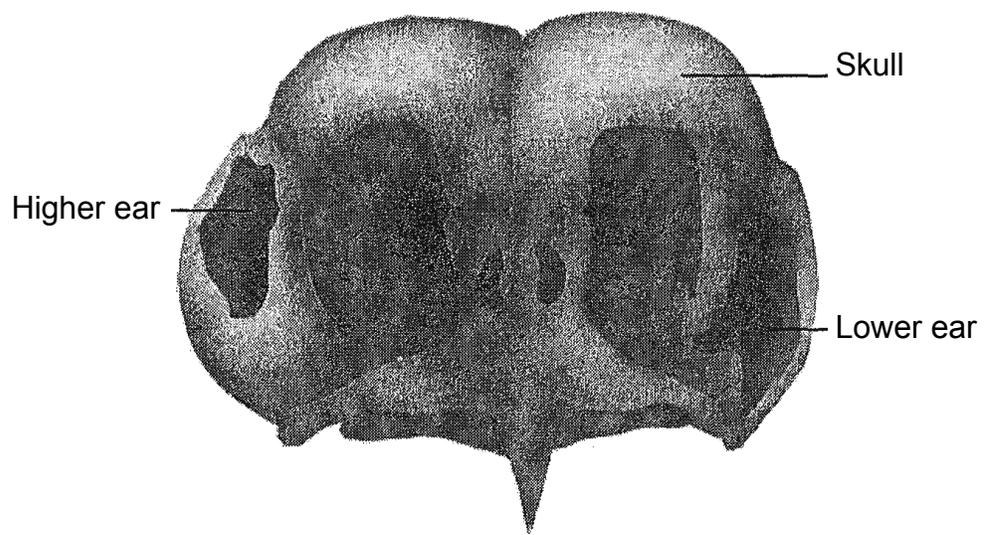
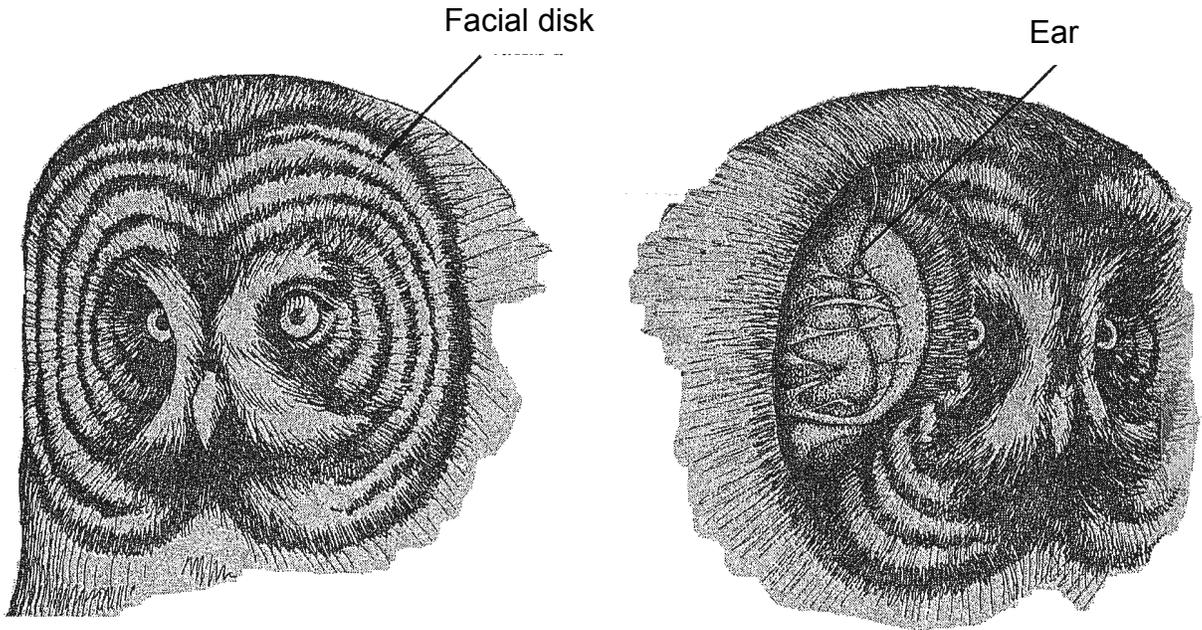
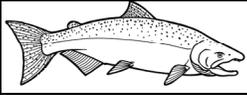


Illustration © Wise as an Owl by L. Langelier, 1992. The Peregrine Fund, Inc., Boise, ID.



## Pre-Work: Taking Flight!

**Subject:** Science

**Concept:** Bird flight

**Key Vocabulary**

- Pectoral muscle
- Lift

**Skills**

- Comparisons

**Materials**

- Watch or clock with second hand
- White board or easel paper
- 8 index cards (3x5) per student
- Markers
- Scissors
- Wingbeat chart
- Teacher Reference, "Wing Diagram"

What would it be like to fly like an eagle and soar among the clouds or ride high on a thermal?

**Grade Level Expectations (GLEs) or Evidence of Learning**

Science

1.3.9 Understand that plant and animal species change over time.

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

**Objectives**

Students will: 1) determine how different birds fly, 2) compare their arms to a bird's wing, and 3) see if they can "flap" as fast as a bird.

**Background**

All birds have wings, even ostriches, penguins, and other flightless birds. The wings of a bird are attached to chest muscles called the pectoral or flight muscles. In flying birds, the pectorals are very powerful muscles. (The breast meat on a chicken, turkey, or other bird is the bird's **pectoral muscle**.)

Bird wings are streamlined like an airplane's wings and zip through the air easily. The wings are curved on top (convex) and are flat or slightly curved (concave) on the bottom. This special shape gives a flying bird the **lift** it needs to get off the ground. Once a bird takes off, the outer ends of the wings (where the main flight feathers attach) act like propellers and rudders, helping the bird move up, down, and forward through the air.

The type of flying a bird does depends on the size and shape of its wings. For example, large soaring birds such as eagles and vultures have long, broad wings. Forest birds such as some owls and songbirds have short, broad wings for flying in and out of thick vegetation. Birds that are fast fliers and spend a lot of time flying such as falcons and swifts, have long pointed wings.

Wings are important even to flightless birds. Penguins use their wings as flippers to help them swim underwater. Wings help ostriches keep their balance as

they run across the grasslands.

Not all birds fly in the same way. For example, turkey vultures can soar for hours without flapping a wing. Hummingbirds flap their wings over 70 times a second as they hover, fly forward, or even fly backward.

### Suggested Procedure

1. Make a transparency of Teacher Reference, “Wing Diagram.”

2. Ask students to hold their arms straight out. Show students the diagram and explain that a bird’s wing is similar to our arm. Both have an upper arm bone connected to the shoulder, an elbow that connects the upper arm to the forearm, and a wrist that connects the forearm to the hand. A bird’s hand section is a little different from ours. It has a bony thumb stuck off to one side and two fingerlike bones on the end. Because a bird’s wing is covered with feathers, it’s hard to see all the bones. The upper arm and forearm make up a bird’s inner wing. The rest of the wing is the hand section.

Gliding birds, such as vultures and gulls, have long inner wings compared to their small hand sections. The large inner wing provides the lift they need to soar. But flapping birds, such as peregrine falcons, have small inner wings and long hand sections. The hand acts like a propeller and pulls the bird forward as it flaps.

3. Have your students try out their “wings” by extending their arms and flapping away. See how long they can keep up an easy flapping pace (one flap per second) before they get tired.

4. Then tell them that some birds, such as the lesser golden plover, can fly for 48 hours straight, flapping the whole time. Ask if their arms ache a little bit from flapping. (They should complain that their outer chest muscles—the pectorals—and their arm muscles are tired.) Explain that since we get around by walking, our leg muscles are more fully developed than our chest muscles. For most birds, it’s just the opposite. Their chest muscles are very well developed to power the wings, and their leg muscles are weaker. Turkeys, chickens, ostriches, and other walking birds have well-developed leg muscles.

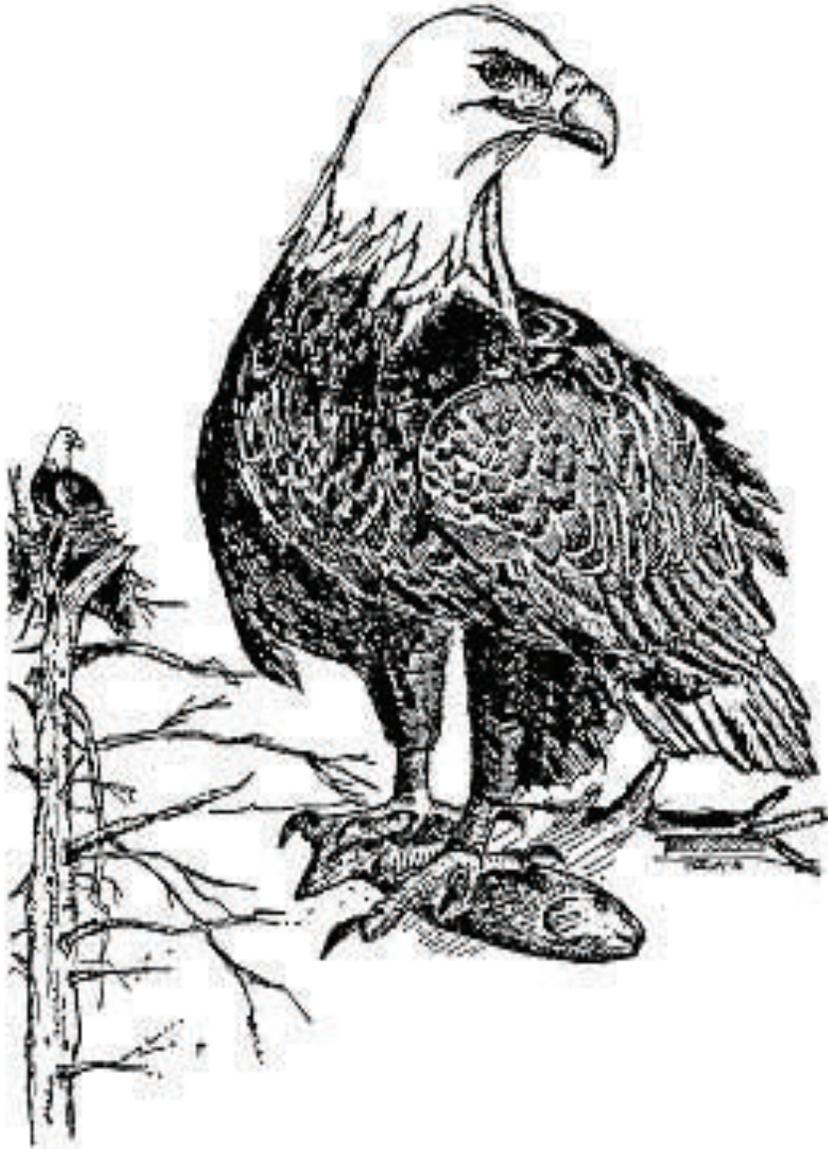
5. Now let’s compare the different wingbeats of birds. Copy the chart onto the board or large piece of easel paper. Ask the kids to decide which rate of flapping they think they can keep up with. Have the whole group come up and flap together or divide into pairs and have one student keep time while the other student flaps. Start with 20 flaps every 10 seconds to imitate a crow. Then try a robin and a pigeon. By the time you get to starlings, students will find it’s impossible to keep up.

Bird	Wingbeat (wb)/10 Seconds (sec)
Crow or Raven	20 wb/10 sec
Robin	23 wb/10 sec
Eagle or Vulture	25 wb/10 sec
Pigeon	30 wb/10 sec
Owl	35 wb/10 sec
Starling	45 wb/10 sec
Kestrel	47 wb/10 sec
Chickadee	270 wb/10 sec
Hummingbird	700 wb/10 sec

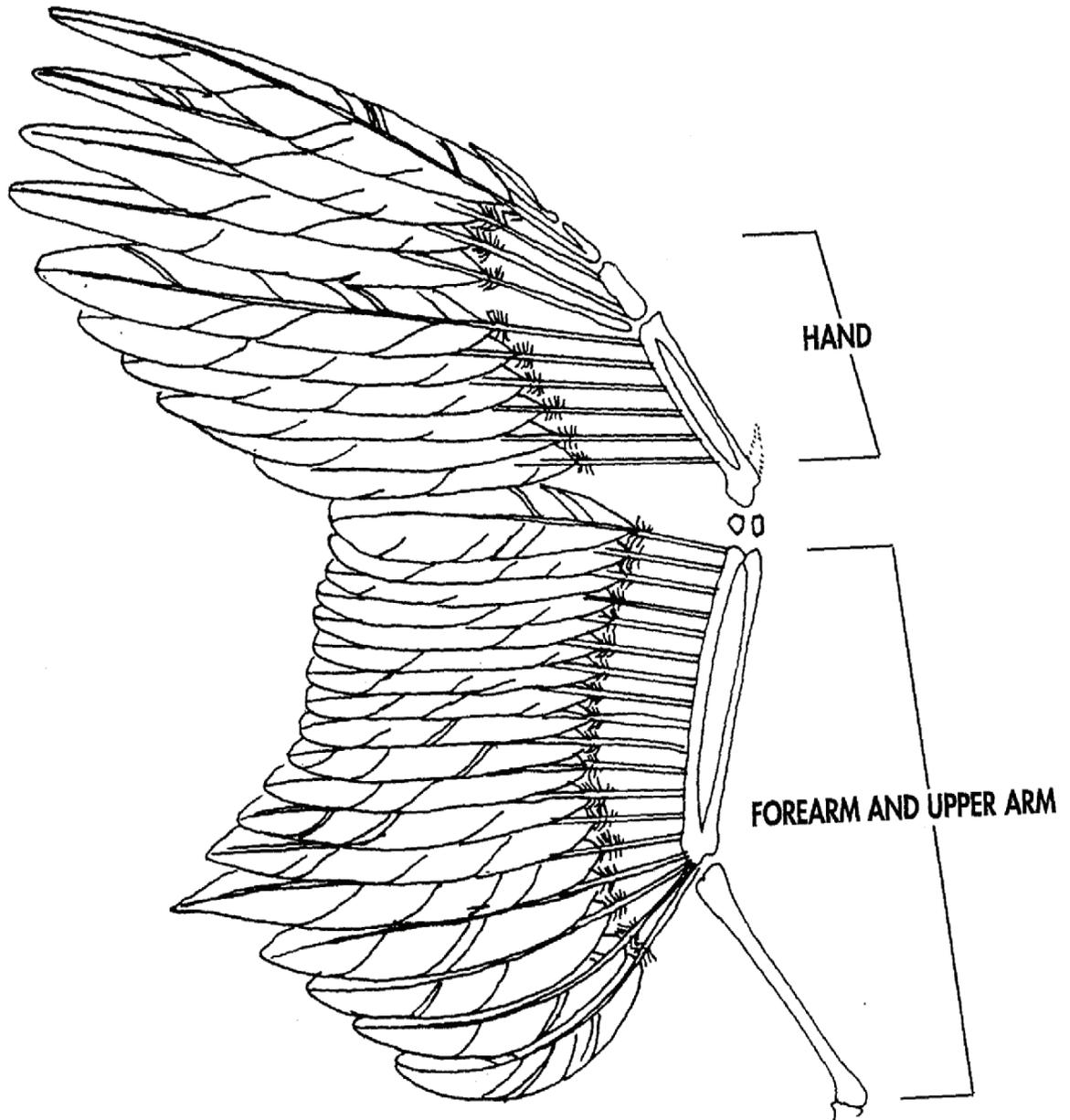
## Vocabulary Words

**Pectoral muscles** - flight muscles or chest muscles where wings of a bird are attached.

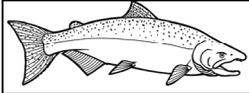
**Lift** - an upward force of flight caused by air with less pressure above a wing moving faster than slower air below, the air below exerts greater pressure, thus creating the upward force.



## Teacher Reference: Wing Diagram



From Raptors in a Box, Teacher Instruction Notebook. Bureau of Land Management.



## Pre-Work: Wings - Shapes and Spans

**Subject:** Science

**Concept:** Bird flight

**Key Vocabulary**

- None

**Skills**

- Observations

**Materials**

- Teacher Reference, "Paper Raptor Designs"
- Teacher Reference, "Wing Diagram"

Hawks, owls, eagles, and falcons have many different wing shapes, depending on the kinds of animals they hunt and the habitat in which they live.

### **Grade Level Expectations (GLEs) or Evidence of Learning**

#### Science

1.3.9 Understand that plant and animal species change over time.

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

### **Objectives**

Students will: 1) describe the basics of flight, and 2) describe and explain wing shape and span of raptors and varying uses for their survival.

### **Background**

Falcons (e.g. peregrine) relies on its wing shape and speed to catch other birds and literally grab them out of the sky. For this bird, a narrow, pointed wing is perfect — *drag* is kept to a minimum and the swept-back wing design allows them to dive at speeds over 100 miles per hour.

However, the wing shapes of hawks, eagles, and vultures are designed to ride the winds. Their wings are much wider with long, slotted wing feathers that can be opened to keep airflow smooth and prevent stalling at slow speeds. This allows the birds an advantage in scanning the ground or water below, watching for movement that signals the presence of prey.

Warm air is lighter than cold air. As the sun heats the earth, it sets up warm air currents or thermals, that rise from the ground. Eagles, hawks, and vultures use their broad wings to soar upward on these thermals. When they reach the top of a column of air, they launch out on a long glide to the next thermal, where they circle upward once again. Without their long, broad wings, they would not be able to soar.

Woodland (forest) hawks have shorter wings and longer tails to allow quick, tight turns among the trees. However, the trade off is that they must do more flapping and are recognized by their typical “flap-flap glide pattern” of flight. They spend less time in the air than soaring birds and usually hunt from a perch. Their short, broad wings allow for quick, steep takeoffs. Owls have long, broad wings with flight feathers that are frayed on the edges to muffle sound and allow silent flight. This is an advantage to a night hunter who must sneak up on its prey without being heard.

### **Suggested Procedure (Paper Raptors)**

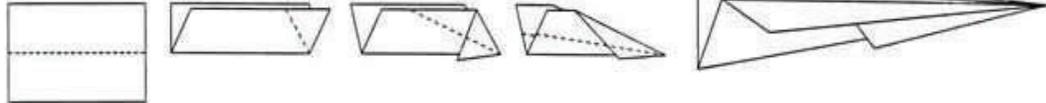
1. Begin by simultaneously dropping a flat piece of paper (unfolded) and a piece of paper that has been folded in quarters crosswise.
2. Ask students to observe which piece of paper drops more slowly and why.
3. Now, give each student two 8 1/2 x 11 pieces of paper. Students will make two paper raptors.
4. Make a transparency of Teacher Reference, “Paper Raptor Designs” and guide students through the folding sequence.
5. Have students predict how each will fly. Then allow students to fly and observe their paper raptors outside or in a gym. Be sure to inform students to observe and compare the designs for:
  - speed
  - distance
  - time aloft (in the air)
6. Discuss what students observed and clarify any questions.
7. Make a transparency of Teacher Reference, “Raptor Silhouettes.”
8. Have students compare:
  - the wide eagle wings and the narrow falcon wings to the wings of the two paper raptor designs
  - the varying wing shapes (width, length, etc.) of the raptors
  - the raptor wingspans to their arm span
9. Discuss what students observed and discuss the functions of each paper raptor design and/or silhouette based upon wing shape and span.

Activity © *Hunters of the Sky* by S. Thoermer ed., 1994. Educational Resources at the Science Museum of Minnesota, St. Paul. MN.

# Teacher Reference: Paper Raptor Designs

## FALCON GLIDER

At each step, be careful to fold the paper toward you on the dotted line.



1) Fold in half lengthwise

2) Fold front edges diagonally to bottom

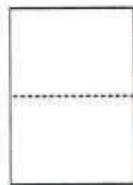
3) Fold front edges to bottom again

4) Fold front edges to bottom once more

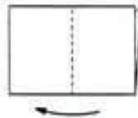
5) Adjust wing angle. Attach a paper clip to the bottom; move it forward and back to see how it affects balance. Then let it FLY!

## EAGLE GLIDER

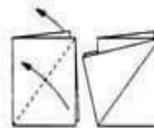
Fold the paper toward you on the dotted line unless directed otherwise.



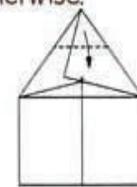
1) Fold in half crosswise



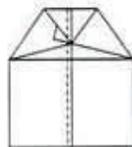
2) Fold in half again



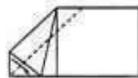
3) Fold corners back diagonally, then unfold steps 1 and 2



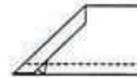
4) Fold point down to point where layers cross, as shown



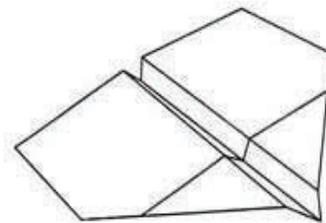
5) Fold in half away from you



6) Fold down front edge, as shown



7) Fold wings down parallel with bottom of plane



8) Adjust the wing angle. Then let it FLY!

# Teacher Reference: Wing Diagram

## EAGLES



Bald eagle



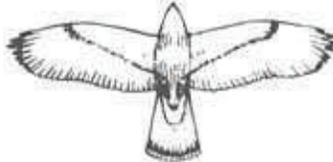
Golden eagle

## VULTURE



Turkey vulture

## BUTEOS



Ferruginous hawk

## FALCONS



American kestrels



Merlin



Prairie falcon



Peregrine falcon

## KITE



Kite



Swainson's hawk



Red-tailed hawk

## OSPREY



Osprey

## ACCIPITERS



Northern goshawk

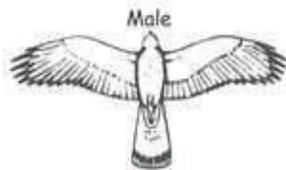


Copper's hawk

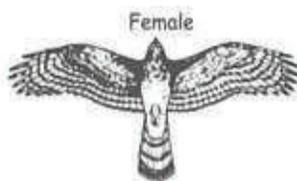


Sharp-shinned hawk

## HARRIERS



Male



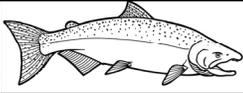
Female

Northern harriers

## OWL



Owl



## Post-Work: Raptor Poetry

**Subjects:** Science and Language Arts

**Concept:** Raptor identification

**Key Vocabulary**

- Depends on words used in poetry writing

**Skills**

- Research
- Writing
- Application

**Materials**

- Reference materials about raptors
- Paper
- Pencils
- Poetry examples

Let's be creative by writing poetry about raptors.

**Grade Level Expectations (GLEs) or Evidence of Learning**

Science

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

**Objectives**

Students will develop poems using at least two poetry forms.

**Suggested Procedure**

1. Have students create a minimum of two poems about raptors using two of the four types of poems listed here:

**Haiku, Diamante, Found, Acrostic** (vertical word)

2. See Teacher Reference, "Raptor Poetry" for directions and examples of each.

3. Go over directions and allow students time to write original poems. You may want to spend time showing more examples of poetry if your class has not spent time on poetry in the past.

4. Create a classroom book of all poems written to share with your future students.



## Teacher Reference: Raptor Poetry

### 1. Haiku

Write a haiku about a raptor. A haiku is a three-line poem that usually describes something in nature. The first line is made up of five syllables, the second line is made up of seven syllables, and the last line is made up of five syllables.

Example:     A bald eagle soars  
                  Silently down the river  
                  In search of its prey.

### 2. Diamonte

Write a diamonte about a bald eagle and a golden eagle. A diamonte is a seven-line poem that is shaped like a diamond. The poem moves from one subject at the top of the poem (the bald eagle) to another subject at the bottom of the poem (the golden eagle). Follow the pattern below to write a diamonte.

Line 1 Write **bald eagle** or a noun related to a bald eagle.

Line 2 Write two adjectives describing the bald eagle.

Line 3 Write three verbs ending in **ing** that tell about the bald eagle.

Line 4 Write four nouns. The first two should be related to the bald eagle. The second two nouns should be related to the golden eagle.

Line 5 Write two verbs ending in **ing** that tell about the golden eagle.

Line 6 Write two adjectives describing the golden eagle.

Line 7 Write **golden eagle** or a noun related to a golden eagle.

### 3. Found

Write a “found” poem by using a piece of writing as your source of information to create a found poem within the writing.

Example: Read the following article about the golden eagle.

The golden eagle has dark brown feathers covering most of its body. The feathers over its head and neck are golden brown, the source of its name. Its tail has gray bands. Its beak is darker in color than a bald eagle’s beak. Its eyes are brown. It feeds mostly on rabbits and mice. It usually builds its nests on cliffs, but in some areas, it prefers trees.

Here is a “found” poem about the golden eagle based on the above article.

Feathers  
Golden brown  
Eyes, beak  
Darker  
Feed  
Rabbits, mice  
Nests on cliffs

Source: The Raptor Center, University of Minnesota

## Teacher Reference: Raptor Poetry, continued

Now you can write your own “found” poem by following these steps:

1. Choose a source of information for your poem. Sources can include reference books, magazines, and Internet resources.

*Visit the website:* Cornell Laboratory of Ornithology <http://birds.cornell.edu>

2. After you have chosen your source of information, read it carefully. Write a list of words and phrases that create a good picture of your topic.

3. Organize the words you have written on your list into a poem. You may use all of your words or only some of them. Feel free to add any extra words you need.

#### 4. **Acrostic (vertical word)**

An acrostic poem uses a word written vertically for its subject. Each line of the poem begins with a letter from the subject word. There is no specific length for the lines of your poem. You might only want one word to stand alone for emphasis, or you may use a phrase or a complete sentence. Try to use vivid language and brainstorm a list of words and ideas to get the best poem.

Example:     **E**xcellent eyesight  
                  **A**lert and majestic  
                  **G**ripping feet with  
                  **L**ong curved talons  
                  **E**njoys its meal

**For more information on raptors, please visit the following websites:**

**Birds of Prey Foundation**

<http://www.birds-of-prey.org>

**Cornell Laboratory of Ornithology**

<http://birds.cornell.edu>

**Hawk Mountain Sanctuary**

<http://www.hawkmountain.org>

**Ornithological Web Library (O.W.L.)**

<http://www.aves.net/the-owl/>

**The Peregrine Fund**

<http://www.peregrinefund.org>

**Southeastern Raptor Rehabilitation Center**

<http://www.vetmed.auburn.edu/raptor>

**Raptor Silhouettes:How to ID Raptors in Flight**

<http://www.sfgate.com/getoutside/1996/sep/raptorid.html>

Raptors flying overhead can be identified by means of their silhouettes.

**Birds of Feather - The Feather Site**

<http://www.geocities.com/SoHo/Bistro/6741/Birds.htm>

A commercial trove of information all about feathers.

**National Audubon Society: Kids & Education**

<http://www.audubon.org/educate/>

Audubon resources for education: adventures, camps, workshops, centers, and sanctuaries; beautifully illustrated with Audubon's original art; links to related sites.

**Ornithology: the Science of Birds**

<http://www.ornithology.com/>

Information and links to *all* aspects of birds: wild birds, lectures, conservation, songs, history, how to bird watch. . . endless!

**Patuxent--Tools for Learning About Birds**

<http://www.mbr-pwrc.usgs.gov/bbs/ident.html>

Patuxent Wildlife Research Center's bird savvy resources; includes photographs, songs, videos, identification tips, maps, and life history information for North American birds; Center located in Laurel, Maryland.

**WWW Grade 2 BIRDS OF PREY**

<http://www.idahoptv.org/dialogue4kids/birdsofprey/index.html>

**Migratory Birds - U.S. Fish and Wildlife Service**

<http://www.fws.gov/pacific/migratorybirds/birding.htm>

**Wings Across the Americas - U.S. Forest Service**

<http://www.fs.fed.us/global/wings/birds/welcome.htm>